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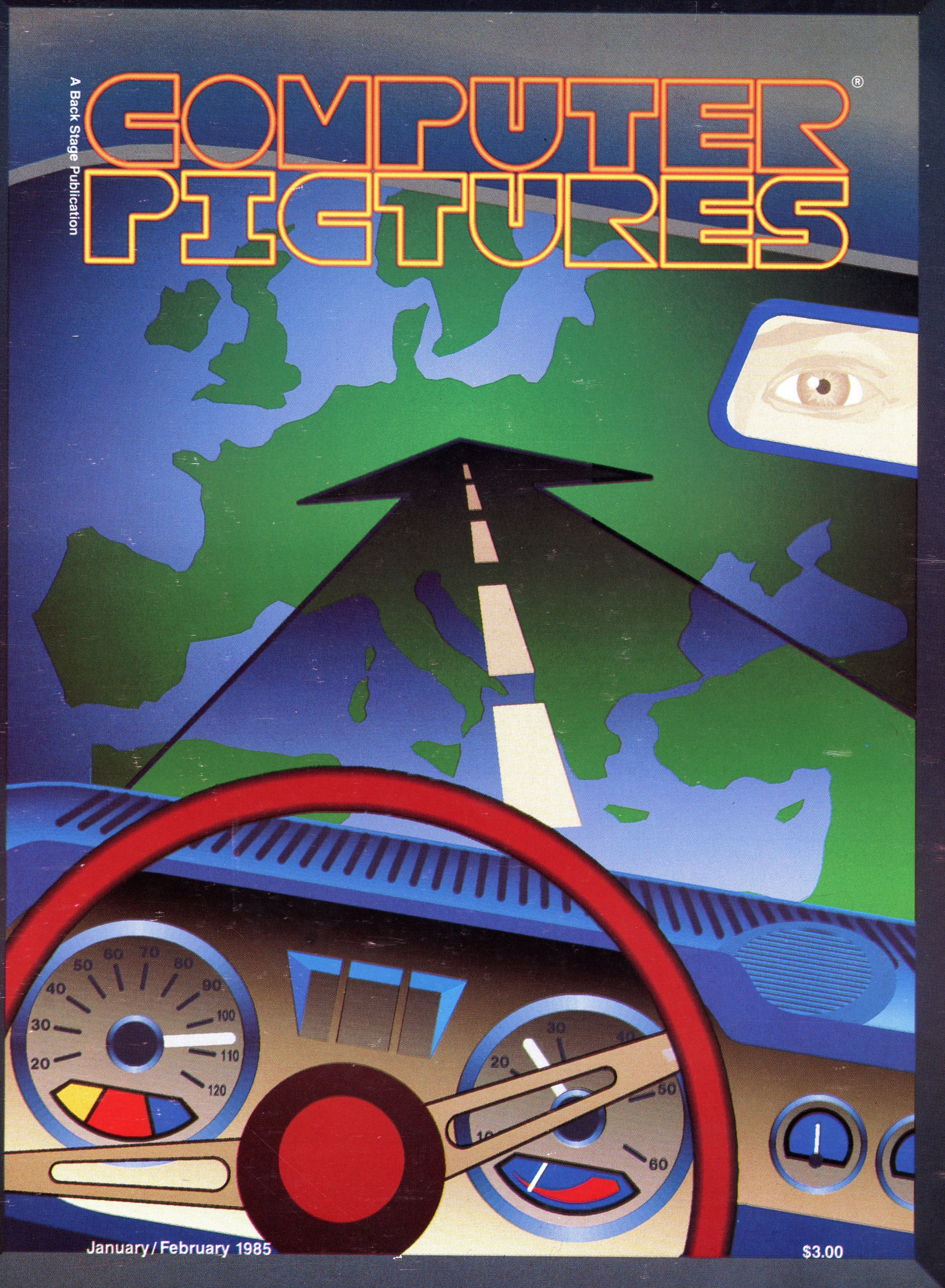

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Inside the Hughes WTT F/A-18 cockpit.

Overlapping Applications Demonstrate A Continuing Consolidation of CGI Markets

BREAKTHRU:

Spherical Mapping by the IMI-500 Mini Supercomputer

by Steffi Sidney

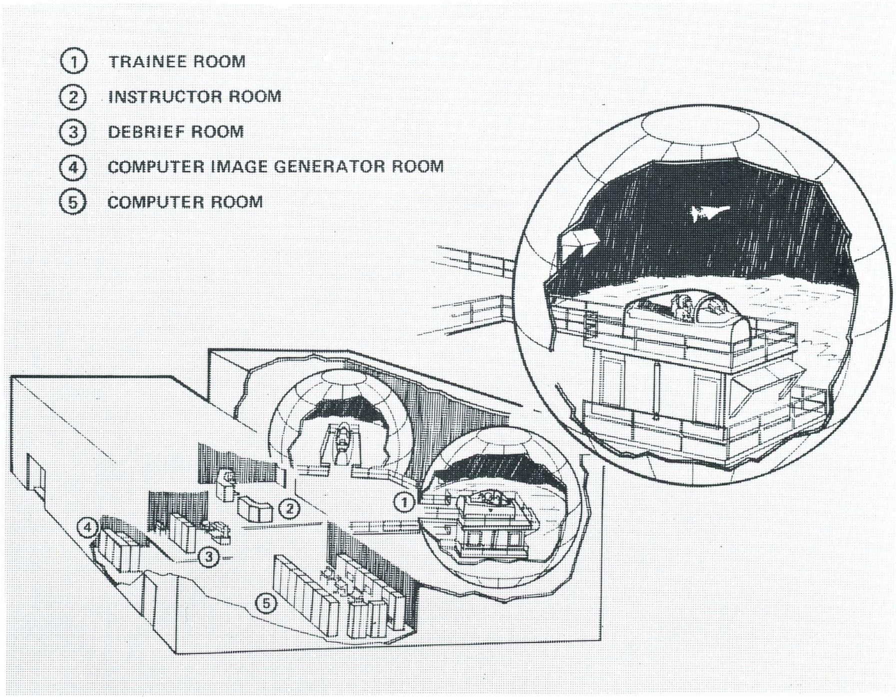
One of the more intriguing aspects of the development of the computer image industry is how hardware designed for applications in one particular direction demonstrates adaptibility by handling work equally well in entirely unrelated fields—unrelated except for one factor: both require flexibility and precision and speed in the creation of high-resolution pictures.

Interactive Machines, Inc., Westlake, California, has designed a piece of equipment that is a good example of this phenomenon. Most recently its IMI-500, characterized by the company as a "mini supercomputer," is being employed by Hughes Aircraft to simulate combat for pilots training on the Navy's new F/A-18 Hornet strike fighter aircraft. In this role the IMI-500 will enable the weapons tactics trainee to experience conditions that might be encountered on an actual combat mission.

At the same time the IMI-500 has established itself, in the words of Ken Dozier, President & CEO of IMI, as a kind of "universal tool" within the industry that provides computer-generated images for commercials and feature films and documentaries. A considerable number of the most productive companies in this field—including Cranston/Csuri, Pacific Data Images, Bo Gehring & Associates, Digital Productions, and MAGI—have made a place for the IMI-500 within their respective systems.

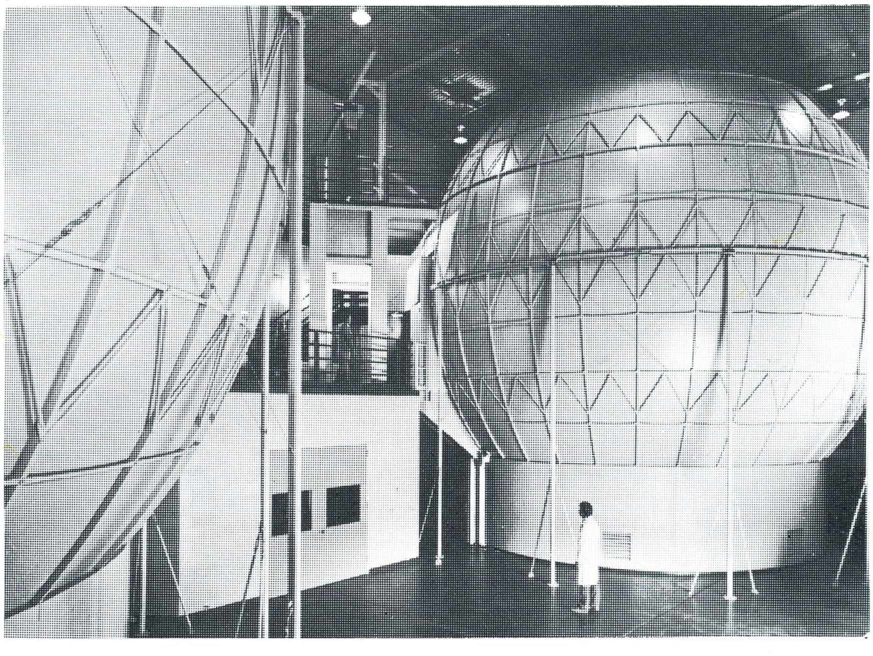
3-D SPHERICAL MAPPING

Checking out the most recent flight simulation application first, the IMI-500 is the "heart" or, more properly, the "brain" of the Weapons Tactics Trainers (WTT) at the Naval Air Station at Lemoore, California. To



Hughes Aircraft Weapons Tactics Trainer.

Hughes Weapons Tactics arena.

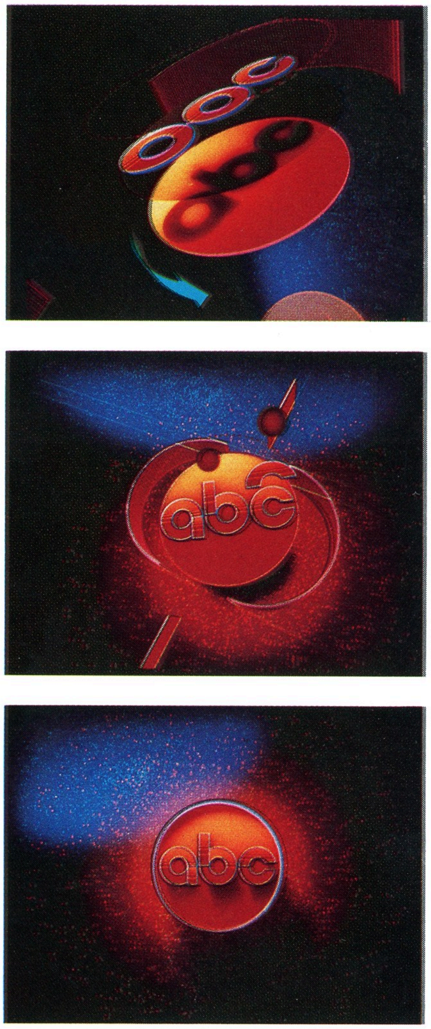


simulate supersonic air superiority and subsonic attack missions for Navy and Marine pilots, Hughes has erected two forty-foot domes, each of which surrounds a cockpit of an F/A-18. From inside the cockpit, the pilot will experience a real-time visual simulation of sky/earth with enemy and friendly aircraft in flight and displayed inside the dome. This technological breakthrough in three dimensional spherical mapping is being credited to the IMI-500 mini supercomputer.

The two trainee stations are independent, each having its own computer system to control all phases of the simulated scenarios. The pilots fly coordinated actions against each other, against an instructor, or against a computer-generated enemy. The trainee utilizes all flight and weapons controls in the cockpit, while experiencing the sights, sounds, accelerations, and buffets that would be encountered on an actual mission.

The WTT is comprised of seven equipment areas. One area contains the two forty-foot diameter spheres which house the aircraft cockpits. Adjacent to the trainee stations are two instructor stations from which the instructors monitor and control the exercises. One floor below the instructor stations are two computer stations. A set of six computers control each dome of the trainer. An area is provided for the IMI-500 computers to generate graphics simulating realistic spherical map problems in real time.

"The F/A-18 is a bubble aircraft in which the pilot has a wide field of view," said Dozier. "The particular problem presented by Hughes Aircraft was to project this wide field of view on a curved surface inside a dome using multiple projectors. The IMI-500 solves this problem by taking aerodynamic information from 13 sel computers, pre-distorting the pictorial data, orienting it properly and feeding a 3-D image in a video format to projectors for projection upon the inside of a dome. Multiple IMI-500s provide 360° and 270° fields of view in real time, predistorted for mapping earth and sky. This process maps the image onto the curved surface; to the pilot the images appear as undistorted.



Bo Gehring & Assoc. created this logo for ABC using the IMI-500. Tech Dir.: George Muhs; Designer: Emmanuel Amit; Director: Randy Akers; Computer Animator: Chris Walker.

Hughes Aircraft reportedly plans to install seven of the new generation of combat simulators, utilizing a total of eighty-six IMI-500 mini supercomputers by 1987. El Toro Naval Station, California and Cecil Field, Florida, are expected to be operational early in 1985. In addition to the Hughes WTT, the IMI-500 is used in the flight simulators of Douglas Aircraft and at NASA where it produces graphic displays to train space shuttle astronauts. Recently the Johnson Space Center of Houston, Texas, purchased an IMI-500 for research by the Graphics Research Facility at the University of Pennsylvania. It will enable the facility to pioneer computer-simulation of human activities in space, forecasting human performances in various zero-gravity environments. "Until now the methods of researching human activity in space were 'static physical,' " said Norm Badler, Associate Professor of Computer Information and Science at the University. "Now software will be developed for the IMI-500 to simulate humans in zero-gravity environments entirely in-computer."

TV SPOT & FEATURES

The range of applications of the IMI-500 is dramatically demonstrated by the fact that it is also "behind the scenes" of many award-winning special effects and animation for motion pictures and television commercials. One of the big attractions of the IMI-500 in this realm is that it can display up to 100 objects simultaneously in real time.

Of course each producer used the IMI-500 according to its own special needs, and depending on the software packages provided by IMI or designed by the production companies.

At Pacific Data Images, located in Silicon Valley, the IMI-500 was used to design the ABC Monday Night Football opening titles for the 84/85 season, the ABC Olympic Logo, the Los Angeles ABC Olympic Patch, the World Olympic Opening and, in conjunction with Marks Communications, the 1984/85 NBC fall promotion package. In addition, PDI "customized" the NBC Logo for over 90 NBC affiliates. In this application the IMI-500 was used for motion design, with software designed by PDI animators Glenn Entis and Don Venhaus.

Carl Rosendahl, founder of PDI and a former Stanford engineer, commented: "For everyday motion design the IMI is a great aid when working closely with clients. We simply pull two chairs in front of the IMI or Raster design station and show the client all the tests that have been made so far. From there we work on touching up the moves, changing the lighting, or even modifying the models."

At Bo Gehring Associates in Los

Angeles the creation of the ABC Logo was done entirely on the IMI-500, according to IMI. "We shot directly off the screen," said Creative Director Chris Walker. "The advantage of doing it this way is that it enables us to get a film quality imagery that is usually cost prohibitive if we were to use Raster. Plus we're able to obtain a very smooth gradation ending with an image that is much finer than can be seen normally through a Raster system. The ABC Logo doesn't look vector, but every single bit of it is." The logo was done with many bi-pac matt passes, according to Walker, isolating certain elements and diffusing others within the bi-pac matt windows, reshooting it numerous times and running the original negative through the camera 60 to 100 times.

In Columbus, Ohio, at Cranston/Csuri, the IMI-500 designs data, pencil tests as well as produces vector animation. Their system is comprised of a 68,000-based microprocessor with a 20 megabyte Winchester disk and 8′ floppy disk. Director of Production at Cranston/Csuri, Wayne Carlson, explained: "We use the IMI-500 for high complexity Raster animation. That's a strange place for a vector device, but it's proved itself." A recent project there was the corporate logo for the Canadian Broadcast Company done in conjunction with Bo Gehring Associates. Gehring did the motion on the IMI and the Raster was done by Cranston/Csuri. "We made some slight modifications," said Carlson, "and redefined with the vector device."

Using the IMI-500, Cranston/Csuri essentially calculates the properties of an object, how fast the highlights drop off (specular reflection), and shadow characteristics, determining all the spatial interactions of the scenes and where the objects fit within the space. Once this data has been calculated, a final motion test is done for client approval.

"We've used the IMI-500 for the last 18 months," said Carlson, "and are just taking delivery of our second one. What is most important to our animators is the real-time playback in the interactive nature of the IMI. Without it they would not be able to evaluate what their motion looks like before going to the expense of actually converting it to Raster."

Currently Cranston/Csuri is working on animation for CBS Evening News. Cranston/Csuri did a spec piece on the IMI, showing the motion, then shot that with a video camera right off the screen and carried it to New York. On the strength of that animation motion test, they were awarded the job.

The IMI is also at work at MAGI-Synthevision of New York, where it is used in scene planning. Their most intriguing use of the IMI, perhaps, was a commercial for Whirlpool. The motion design was planned on the IMI and then the data input information was fed into MAGI's own computer program, Synthavision.

MAGI's Chairman, Dr. Philip Mittleman, said that his company is developing a program to integrate the IMI into their own production system. "The plan calls for designing objects on the IMI, taking that output and feeding it back into our process, Synthavision, which will then proceed to calculate the fully shaded pictures and instruct the computer how to move the objects around."

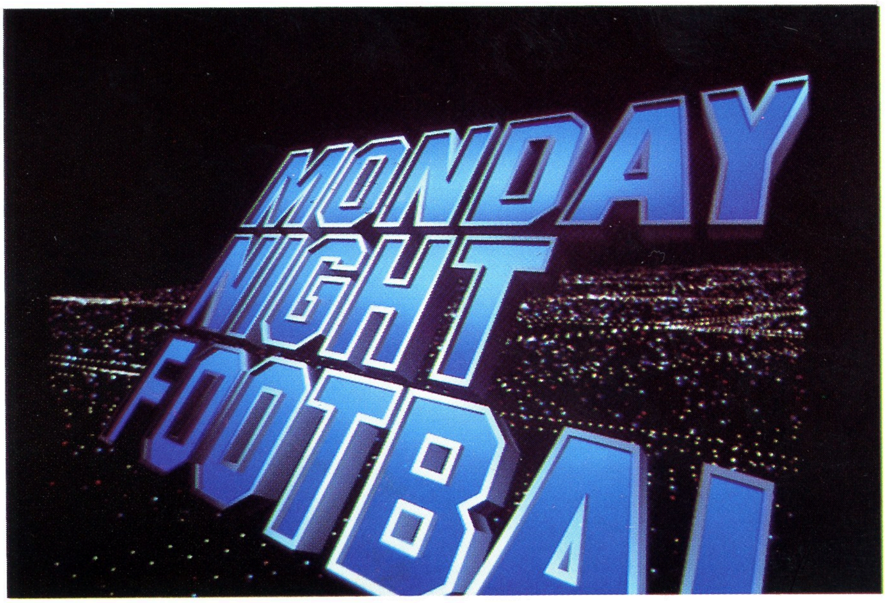
Universal studios in Universal City, California has addressed the issue of inserts for its television shows by using the IMI. "The problem Universal was facing," said IMI's Dozier

Cranston/Csuri "pieced together" this logo for CBC via the IMI-500. Tech Dir/Animator: Mark Steeves; Software Developer: Shaun Ho. at Cranston/Csuri. At Bo Gehring, Producer: Ilene Kramer. Creative Dir.: Chris Walker.

NBC-TV '84-85 promo graphics package produced for Marks Communications by Pacific Data Images. Creative Dir.: Harry Marks. Animator: Glenn Entis.

HBO/Cinemax commissioned Cranston/Csuri to "boost" their image. Tech Dirs.: John Berton, Mark Steeves, Peter Carswell, Marc Howard. At HBO: Design Dir: Orest Woronewych; Designer: Paul Fuentes. On Air Promo Dir: Ken Keefer.

"was reliability and difficulty with deliveries, especially when they attempted to keep costs down. So they brought the capability in-house. This way, said Dozier, they were able to produce high-quality/low costs inserts for their high-tech TV shows "Knight Rider" and "Airwolf." All the graphic inserts for the instrument panels inside Knight Rider's car and Airwolf's helicopter were executed by the IMI.



Monday Night Football gets an exciting "kick off" with this creation by Pacific Data Images.

Digital Productions, Los Angeles, uses three IMI-500s as an interactive link for their high speed computers such as the VAX and Cray XMP. Digital uses a four-step process for producing their Digital Scene Simulation^{sm}. The first step is building of objects. The second is building motion. The third, light a scene and the final step is filming. It's in the second step, motion building, plotting and choreographing all motion that the IMI-500 is used. The IMI-500 is connected to the VAX equipment by an ethernet and then the motion is built that will make a file of matrixes and put them into the Cray XMP. The ability of the IMI to concatenate matrixes at a phenomenal rate allows it to preview in real-time hierarchical tree-structures in wireframe mode for use in scene planning.

"Our studio's breakthrough—22 minutes of computer-effects produced for the motion picture 'The Last Starfighter,' would have been impossible without the IMI real-time vector system," stated Sherry McKenna, VP-executive in charge of production of Digital Productions.

Disney Productions also uses IMI's mini supercomputer to plot some of its famous animation.

While speed may be of the essence and image quality is essential in the computer graphics trade, an increasingly important by-word in the industry of tomorrow will be flexibility, and the IMI-500—both as a breakthru tool in simulation and as a reliable partner in production—is already answering some of those needs.

ARTWORK FOR COMPUTER PICTURES

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Slides or other artwork will be retained on file for possible future use unless return of material is requested in writing.